

WHAT IS CLAIMED IS:

1. A process of preparing an olefin comprising contacting a paraffinic hydrocarbon with oxygen in the presence of a catalyst, the contacting being conducted under autothermal process conditions sufficient to prepare the olefin, the catalyst comprising at least one Group 5 8B metal and, optionally, at least one promoter metal, said metal(s) being supported on a fiber monolith support.
2. The process of Claim 1 wherein the paraffinic hydrocarbon comprises one or more saturated hydrocarbons each having from 2 to about 25 carbon atoms.
3. The process of Claim 2 wherein the paraffinic hydrocarbon comprises ethane, 10 propane, or mixtures thereof.
4. The process of Claim 2 wherein the paraffinic hydrocarbon is selected from naphtha, natural gas condensates, gas oils, vacuum gas oils, and mixtures thereof.
5. The process of Claim 1 wherein the molar ratio of paraffinic hydrocarbon to oxygen ranges from about 3 to about 13 times the stoichiometric ratio of hydrocarbon to 15 oxygen for complete combustion to carbon dioxide and water.
6. The process of Claim 1 wherein the molar ratio of paraffinic hydrocarbon to oxygen is greater than about 0.1:1 and less than about 3.0:1.
7. The process of Claim 1 wherein a diluent is used.
8. The process of Claim 7 wherein the diluent is used in an amount greater than 20 about 0.1 mole percent and less than about 70 mole percent, based on the total reactant feed.
9. The process of Claim 1 wherein the Group 8B metal is a platinum group metal.
10. The process of Claim 9 wherein the platinum group metal is platinum.
11. The process of Claim 1 wherein the support is a ceramic selected from silica, alumina, silica-aluminas, aluminosilicates, zirconia, titania, boria, zirconia mullite alumina, 25 lithium aluminum silicates, and oxide-bonded silicon carbide.

12. The process of Claim 11 wherein the ceramic support comprises from about 60 to about 100 weight percent alumina.

13. The process of Claim 1 wherein each fiber comprising the fiber monolith has a diameter greater than about 1 micron and less than about 20 microns, and a surface area
5 greater than about $0.001 \text{ m}^2/\text{g}$ and less than about $1 \text{ m}^2/\text{g}$.

14. The process of Claim 1 wherein the fiber monolith is in the form of a fiber mat.

15. The process of Claim 1 wherein the promoter metal is selected from Groups 2A, 1B, 3A, 4A, and the rare earth lanthanide elements, and mixtures thereof.

16. The process of Claim 15 wherein the atomic ratio of Group 8B metal to
10 promoter metal ranges from greater than about 1:10 to less than about 1:0.5.

17. The process of Claim 1 wherein the temperature is greater than about 750°C and less than about $1,150^\circ\text{C}$.

18. The process of Claim 1 wherein the pressure ranges from about 1 atm abs (100 kPa abs) to about 20 atm abs (2,000 kPa abs).

19. The process of Claim 1 wherein the gas hourly space velocity is greater than
15 about $80,000 \text{ h}^{-1}$ and less than about $6,000,000 \text{ h}^{-1}$.

20. The process of Claim 1 wherein the conversion of paraffinic hydrocarbon is greater than about 55 mole percent.

21. The process of Claim 1 wherein the olefin selectivity is greater than about
20 70 carbon atom percent.

22. The process of Claim 1 wherein the paraffin is ethane and the contacting is conducted under autothermal conditions at an ethane to oxygen molar ratio greater than about 1.5:1 and less than about 2.7:1, a gas hourly space velocity greater than about $100,000 \text{ h}^{-1}$ and less than about $4,000,000 \text{ h}^{-1}$, wherein a diluent is used in an amount greater than
25 about 1 mole percent and less than about 70 mole percent based on the total reactant feed, wherein the Group 8B metal is platinum, and the fiber monolith comprises from about 60 to about 100 weight percent alumina.

23. A catalyst composition comprising at least one Group 8B metal and at least one promoter metal, said metals being supported on a fiber monolith support.

24. The composition of Claim 23 wherein the Group 8B metal is a platinum group metal.

5 25. The composition of Claim 24 wherein the platinum group metal is platinum.

26. The composition of Claim 23 wherein the promoter metal is selected from Groups 2A, 1B, 3A, 4A, and the lanthanide elements, and mixtures thereof.

10 27. The composition of Claim 23 wherein the monolith is a ceramic selected from silica, alumina, silica-aluminas, aluminosilicates, zirconia, titania, boria, zirconia mullite alumina, lithium aluminum silicates, and oxide-bonded silicon carbide.

28. The composition of Claim 27 wherein the ceramic monolith comprises from about 60 to about 100 weight percent alumina.

15 29. The composition of Claim 23 wherein each of the fibers comprising the fiber monolith has a fiber diameter greater than about 1 micron and less than about 20 microns, and a surface area greater than about 0.001 m²/g and less than about 1 m²/g.

30. The composition of Claim 23 wherein the fiber monolith consists essentially of 62 weight percent alumina, 24 weight percent silica, and 14 weight percent boria.

20 31. A catalyst composition comprising at least one Group 8B metal and, optionally, at least one promoter metal, said metal(s) being supported on the front face of a monolith support.

32. The composition of Claim 31 wherein the Group 8B metal is a platinum group metal.

33. The composition of Claim 32 wherein the platinum group metal is platinum.

25 34. The composition of Claim 31 wherein the promoter metal is selected from Groups 2A, 1B, 3A, 4A, and the lanthanide elements, and mixtures thereof.

35. The composition of Claim 31 wherein the monolith is a ceramic selected from silica, alumina, silica-aluminas, aluminosilicates, zirconia, titania, boria, zirconia mullite alumina, lithium aluminum silicates, and oxide-bonded silicon carbide.

5 36. The composition of Claim 31 wherein the ceramic monolith comprises from about 60 to about 100 weight percent alumina.

37. The composition of Claim 31 wherein the monolith support is in the form of a honeycomb, foam, or fiber mat.

10 38. A process of preparing an olefin comprising contacting a paraffinic hydrocarbon with oxygen in the presence of a catalyst, the contacting being conducted under autothermal process conditions sufficient to prepare the olefin, the catalyst comprising at least one Group 8B metal and, optionally, at least one promoter metal, said metal(s) being supported on the front face of a monolith support.

39. The process of Claim 38 wherein the paraffinic hydrocarbon comprises one or more saturated hydrocarbons each having from 2 to about 25 carbon atoms.

15 40. The process of Claim 38 wherein the paraffinic hydrocarbon comprises ethane, propane, or mixtures thereof.

41. The process of Claim 38 wherein the paraffinic hydrocarbon is selected from naphtha, natural gas condensates, gas oils, vacuum gas oils, and mixtures thereof.

20 42. The process of Claim 38 wherein the molar ratio of paraffinic hydrocarbon to oxygen ranges from about 3 to about 13 times the stoichiometric ratio of hydrocarbon to oxygen for complete combustion to carbon dioxide and water.

43. The process of Claim 38 wherein the molar ratio of paraffinic hydrocarbon to oxygen is greater than about 0.1:1 and less than about 3.0:1.

44. The process of Claim 38 wherein a diluent is used.

25 45. The process of Claim 44 wherein the diluent is used in an amount greater than about 0.1 mole percent and less than about 70 mole percent, based on the total reactant feed.

46. The process of Claim 38 wherein the Group 8B metal is a platinum group metal.

47. The process of Claim 46 wherein the platinum group metal is platinum.

48. The process of Claim 38 wherein the support is a ceramic selected from silica, alumina, silica-aluminas, aluminosilicates, zirconia, titania, boria, zirconia mullite alumina, lithium aluminum silicates, and oxide-bonded silicon carbide.

49. The process of Claim 48 wherein the ceramic support comprises from about 60 to about 100 weight percent alumina.

50. The process of Claim 38 wherein the promoter metal is selected from Groups 2A, 1B, 3A, 4A, and the rare earth lanthanide elements, and mixtures thereof.

51. The process of Claim 38 wherein the atomic ratio of Group 8B metal to promoter metal ranges from greater than about 1:10 to less than about 1:0.5.

52. The process of Claim 38 wherein the temperature is greater than about 750°C and less than about 1,150°C.

53. The process of Claim 38 wherein the pressure ranges from about 1 atm abs (100 kPa abs) to about 20 atm abs (2,000 kPa abs).

54. The process of Claim 38 wherein the gas hourly space velocity is greater than about 80,000 h⁻¹ and less than about 6,000,000 h⁻¹.

55. The process of Claim 38 wherein the conversion of paraffinic hydrocarbon is greater than about 55 mole percent.

56. The process of Claim 38 wherein the olefin selectivity is greater than about 70 carbon atom percent.

57. The process of Claim 38 wherein the paraffin is ethane and the contacting is conducted under autothermal conditions at an ethane to oxygen molar ratio greater than about 1.5:1 and less than about 2.7:1, a gas hourly space velocity greater than about 100,000 h⁻¹ and less than about 4,000,000 h⁻¹, wherein a diluent is used in an amount greater than about 1 mole percent and less than about 70 mole percent based on the total reactant feed,

wherein the Group 8B metal is platinum, and the monolith comprises from about 60 to about 100 weight percent alumina.